

SAFETY DATA SHEET

1. SUBSTANCE AND SOURCE IDENTIFICATION

Product Identifier

SRM Number: 423
SRM Name: Molybdenum Oxide Concentrate
Other Means of Identification: Not applicable.

Recommended Use of This Material and Restrictions of Use

This Standard Reference Material (SRM) is intended for use in the evaluation of chemical and instrumental methods of analysis. A unit of SRM 423 consists of one pouch containing approximately 60 g of molybdenum oxide (MoO₃) powder, a concentrate from a commercial mining and refining process.

Company Information

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2. HAZARDS IDENTIFICATION

Classification

| | |
|---|---|
| Physical Hazard: Not classified. | |
| Health Hazard: Eye Damage/Irritation | Category 2B |
| STOT, Single Exposure | Category 3, Respiratory Tract Irritation. |

Label Elements

Symbol



Signal Word

WARNING

Hazard Statement(s)

| | |
|------|-----------------------------------|
| H320 | Causes eye irritation. |
| H335 | May cause respiratory irritation. |

Precautionary Statement(s)

| | |
|----------------|---|
| P261 | Avoid breathing dust. |
| P264 | Wash hands thoroughly after handling. |
| P271 | Use only outdoors or in a well-ventilated area. |
| P304+P340 | If inhaled: Remove person to fresh air and keep comfortable for breathing. |
| P312 | Call a doctor if you feel unwell. |
| P305+P351+P338 | If in eyes: Rinse cautiously with water for several minutes. Remove contacts if present and easy to do. Continue rinsing. |
| P337+P313 | If eye irritation persists: Get medical attention. |
| P403+P233 | Store in well-ventilated place. Keep container tightly closed. |
| P405 | Store locked up. |
| P501 | Dispose of contents and container according to local regulations. |

Hazards Not Otherwise Classified: Not applicable.

Ingredients(s) with Unknown Acute Toxicity: Not applicable.

3. COMPOSITION AND INFORMATION ON HAZARDOUS INGREDIENTS

Substance: Molybdenum trioxide

Other Designations: molybdenum oxide; molybdena; molybdic trioxide.

Components are listed in compliance with OSHA's 29 CFR 1910.1200. The material contains trace amounts of other oxide components; for the actual values see the NIST Certificate of Analysis.

| Hazardous Component(s) | CAS Number | EC Number (EINECS) | Nominal Mass Concentration (%) |
|------------------------|------------|-----------------------|-----------------------------------|
| Molybdenum oxide | 1313-27-5 | 215-204-7 | >90 |

4. FIRST AID MEASURES

Description of First Aid Measures:

Inhalation: If adverse effects occur, remove to uncontaminated area. If not breathing, give artificial respiration or oxygen by qualified personnel. Seek immediate medical attention.

Skin Contact: Wash skin with soap and water.

Eye Contact: Flush eyes with water for at least 15 minutes. If necessary, seek medical attention.

Ingestion: If adverse effects occur after ingestion, seek medical treatment.

Most Important Symptoms/Effects, Acute and Delayed: May cause respiratory tract and eye irritation.

Indication of any immediate medical attention and special treatment needed, if necessary: If any of the above symptoms are present, seek medical attention if needed.

5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Negligible fire hazard. Avoid generating dust. See Section 9, "Physical and Chemical Properties" for flammability properties.

Extinguishing Media:

Suitable: Use extinguishing media appropriate for surrounding fire.

Unsuitable: None listed.

Specific Hazards Arising from the Chemical: None listed.

Special Protective Equipment and Precautions for Fire-Fighters: Avoid inhalation of material or combustion byproducts. Wear full protective clothing and NIOSH approved self-contained breathing apparatus (SCBA).

NFPA Ratings (0 = Minimal; 1 = Slight; 2 = Moderate; 3 = Serious; 4 = Severe)

Health = 1

Fire = 0

Reactivity = 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures: Any accumulated material on surfaces should be removed and properly disposed of. Use suitable protective equipment; see Section 8, "Exposure Controls and Personal Protection".

Methods and Materials for Containment and Clean up: Collect spilled material in appropriate container for disposal. Keep out of water supplies and sewers. Keep unnecessary people away, isolate hazard area and deny entry.

7. HANDLING AND STORAGE

Safe Handling Precautions: Minimize dust generation and accumulation on surfaces. Routine housekeeping should be instituted to ensure that dusts do not accumulate on surfaces. See Section 8, "Exposure Controls and Personal Protection".

Storage: Store and handle in accordance with all current regulations and standards.

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits: No occupational exposure limits have been established for molybdenum oxide. This material is a particulate matter and adequate inhalation/respiratory protection should be used to minimize exposure. The exposure limits for Particulates Not Otherwise Regulated (PNOR) are applicable.

OSHA (PEL): 15 mg/m³ (TWA, total particulates)
OSHA (PEL): 5 mg/m³ (TWA, respirable particulates)

NIOSH (REL): 10 mg/m³ (TWA, total particulates)
NIOSH (REL): 5 mg/m³ (TWA, respirable particulates)

Engineering Controls: Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

Personal Protection: In accordance with OSHA 29 CFR 1910.132, subpart I, wear appropriate Personal Protective Equipment (PPE) to minimize exposure to this material.

Respiratory Protection: If workplace conditions warrant a respirator, a respiratory protection program that meets OSHA 29CFR 1910.134 must be followed. Refer to NIOSH 42 CFR 84 for applicable certified respirators.

Eye/Face Protection: Wear splash resistant safety goggles with a face shield. An eye wash station should be readily available near areas of use.

Skin and Body Protection: Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. Chemical-resistant gloves should be worn at all times when handling chemicals.

9. PHYSICAL AND CHEMICAL PROPERTIES

| Descriptive Properties: | Molybdenum Oxide |
|--|---|
| Appearance (physical state, color, etc.) | colorless to blue powder |
| Molecular Formula | MoO ₃ |
| Molar Mass (g/mol) | 143.94 |
| Odor | odorless |
| Odor threshold | not available |
| pH | not available |
| Evaporation rate | not applicable |
| Melting point/freezing point | 795 °C (1463 °F) |
| Specific Gravity (water=1) | 4.692 |
| Vapor Pressure (mmHg) | not available |
| Vapor Density (air = 1) | not available |
| Viscosity (cP) | not available |
| Solubility(ies) | water: 0.22 % at 28 °C soluble: concentrated nitric acid/hydrochloric acid mixtures, concentrated nitric acid; concentrated sulfuric acid; ammonium bitartrate |
| Partition coefficient (n-octanol/water) | not available |
| Particle Size | not available |
| Thermal Stability Properties: | |
| Autoignition Temperature | not available |
| Thermal Decomposition | not available |
| Initial boiling point and boiling range | not available |
| Explosive Limits, LEL (Volume %) | not available |
| Explosive Limits, UEL (Volume %) | not available |
| Flash Point | not available |
| Flammability (solid, gas) | not available |

10. STABILITY AND REACTIVITY

Reactivity: Stable at normal temperatures and pressure.

Stability: X Stable Unstable

Possible Hazardous Reactions: None listed.

Conditions to Avoid: Avoid generating dust. Avoid heat, flames, sparks, and other sources of ignition.

Incompatible Materials: Halogens, metals.

Fire/Explosion Information: See Section 5, "Fire Fighting Measures".

Hazardous Decomposition: Thermal decomposition will produce oxides of molybdenum, oxides of sulfur.

Hazardous Polymerization: Will Occur X Will Not Occur

11. TOXICOLOGICAL INFORMATION

Route of Exposure: X Inhalation X Skin Ingestion

Symptoms Related to the Physical, Chemical and Toxicological Characteristics: Generated dust may cause irritation, if inhaled or in eyes.

Potential Health Effects (Acute, Chronic and Delayed):

Inhalation: May cause irritation in the respiratory tract. Has been reported to cause cystic fibrosis, focal pneumoconiosis and cough. Mice produced increased alveolar/bronchiolar carcinoma in a two year study.

Skin Contact: May cause mechanical irritation.

Eye Contact: May cause mechanical irritation.

Ingestion: No data available.

Numerical Measures of Toxicity:

Acute Toxicity: Not classified.

Inhalation, Rat LC50: >5840 mg/m³ (4 h)

Oral, Rat LD50: 2689 mg/kg

Skin, Rat LD50: >2000 mg/kg

Skin Corrosion/Irritation: Not classified; no data available.

Serious Eye Damage/Eye Irritation: Category 2. May cause eye irritation.

Respiratory Sensitization: Not classified; no data available.

Skin Sensitization: Not classified; no data available.

Germ Cell Mutagenicity: Not classified; no data available.

Carcinogenicity: Not classified.

Listed as a Carcinogen/Potential Carcinogen Yes X No

Molybdenum oxide is not listed by NTP, IARC or OSHA as a carcinogen/potential carcinogen.

Mutagenic data: Hamster, 500 mg/L.

Tumorigenic data: Inhalation, Rat, TCLO: 100 mg/m³ (6 h);

Inhalation, Mouse, TCLO: 10 mg/m³ (6 h);

Intraperitoneal, Mouse, TCLO: 4750 mg/kg (7 week).

Reproductive Toxicity: Not classified; no data available.

Specific Target Organ Toxicity, Single Exposure: Category 3, Respiratory irritation.

Specific Target Organ Toxicity, Repeated Exposure: Not classified; no data available.

Aspiration Hazard: Not classified; no data available.

12. ECOLOGICAL INFORMATION

Ecotoxicity Data: No data available.

Persistence and Degradability: No data available.

Bioaccumulative Potential: No data available.

Mobility in Soil: No data available.

Other Adverse effects: No data available.

13. DISPOSAL CONSIDERATIONS

Waste Disposal: Dispose of waste in accordance with all applicable federal, state, and local regulations.

14. TRANSPORTATION INFORMATION

U.S. DOT and IATA: Not regulated by DOT or IATA.

15. REGULATORY INFORMATION

U.S. Regulations:

CERCLA Sections 102a/103 (40 CFR 302.4): Not regulated.

SARA Title III Section 302 (40 CFR 355.30): Not regulated.

SARA Title III Section 304 (40 CFR 355.40): Not regulated.

SARA Title III Section 313 (40 CFR 372.65): 1 % de minimis concentration (related to Molybdenum compounds).

OSHA Process Safety (29 CFR 1910.119): Not regulated.

SARA Title III Sections 311/312 Hazardous Categories (40 CFR 370.21):

ACUTE HEALTH: Yes.

CHRONIC HEALTH: No.

FIRE: No.

REACTIVE: No.

PRESSURE: No.

State Regulations:

California Proposition 65: Not listed.

U.S. TSCA Inventory: Molybdenum oxide is listed.

TSCA 12(b), Export Notification: Not listed.

Canadian Regulations: WHMIS Information is not provided for this material.

16. OTHER INFORMATION

Issue Date: 24 April 2015

Sources: ChemADVISOR, Inc., SDS, *Molybdenum Oxide*, 15 December 2014.

29 CFR Occupational Health and Safety Office (OSHA) 1910.1000, *Limits for Air Contaminants*, Table Z-1; available at

http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9992 (accessed April 2015).

Center for Disease Control (CDC) NIOSH Pocket Guide to Chemical Hazards, *Particulates not otherwise regulated*; available at <http://www.cdc.gov/niosh/npg/npgd0480.html> (accessed April 2015).

ChemIDplus Advanced, National Library of Medicine's TOXNET system, *Molybdenum Trioxide* CAS No. 1313-27-5; available at <http://chem.sis.nlm.nih.gov/chemidplus/> (accessed April 2015).

Key of Acronyms:

| | | | |
|--------|---|-------|--|
| ACGIH | American Conference of Governmental Industrial Hygienists | NRC | Nuclear Regulatory Commission |
| ALI | Annual Limit on Intake | NTP | National Toxicology Program |
| CAS | Chemical Abstracts Service | OSHA | Occupational Safety and Health Administration |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act | PEL | Permissible Exposure Limit |
| CFR | Code of Federal Regulations | RCRA | Resource Conservation and Recovery Act |
| DOT | Department of Transportation | REL | Recommended Exposure Limit |
| EC50 | Effective Concentration, 50 % | RM | Reference Material |
| EINECS | European Inventory of Existing Commercial Chemical Substances | RQ | Reportable Quantity |
| EPCRA | Emergency Planning and Community Right-to-Know Act | RTECS | Registry of Toxic Effects of Chemical Substances |
| IARC | International Agency for Research on Cancer | SARA | Superfund Amendments and Reauthorization Act |
| IATA | International Air Transportation Agency | SCBA | Self-Contained Breathing Apparatus |
| IDLH | Immediately Dangerous to Life and Health | SRM | Standard Reference Material |
| LC50 | Lethal Concentration, 50 % | STEL | Short Term Exposure Limit |
| LD50 | Lethal Dose, 50 % | TLV | Threshold Limit Value |
| LEL | Lower Explosive Limit | TPQ | Threshold Planning Quantity |
| MSDS | Material Safety Data Sheet | TSCA | Toxic Substances Control Act |
| NFPA | National Fire Protection Association | TWA | Time Weighted Average |
| NIOSH | National Institute for Occupational Safety and Health | UEL | Upper Explosive Limit |
| NIST | National Institute of Standards and Technology | WHMIS | Workplace Hazardous Materials Information System |

Disclaimer: Physical and chemical data contained in this SDS are provided only for use in assessing the hazardous nature of the material. The SDS was prepared carefully, using current references; however, NIST does not certify the data in the SDS. The certified values for this material are given in the NIST Certificate of Analysis.

Users of this SRM should ensure that the SDS in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srmmsds@nist.gov; or via the Internet at <http://www.nist.gov/srm>.